

# Moral Decision Making

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### **Statements of Sources**

I declare that this report is my own original work and that contributions of others have been duly acknowledged.

Signed: \_\_\_\_\_ Date: 18/10/2018

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## Abstract

The present study investigated the underlying process of moral decision making, by comparing two prominent theories, and factors that can moderate this. The dual process model suggests cognitive load will selectively reduce utilitarian inclinations (as both the decision and increased cognitive load use cognitive resources), whilst having no effect on deontological inclinations; the Social Intuitionist Model stipulates cognitive load will have no effect on either. The more people saved (for the same number killed; efficient ratio) the more utilitarian the response should be. **Method:** One hundred and sixty-six participants (125 females; aged 18-73 years, 40 males; aged 19 to 68, and one 24-year-old who did not identify as either) were allocated into one of four conditions, manipulating both cognitive load and kill/save ratio (KSR). Participants remembered a digit string (easy or hard depending on condition) whilst answering a moral dilemma and then answered questions about the difficulty, of the questions and memory task, and some demographics. **Results:** Bayesian analysis provide some evidence in favour of the null hypothesis for an effect of cognitive load; thus, there is no effect – supporting the Social Intuitionist Model. There is definitive evidence suggesting there is an effect of KSR consistent with theory. **Conclusion:** Results suggest social and cultural influences determine one's moral principles, and thus cognitive load will have no effect on the decision. KSR has an impact to an extent; however, some individual differences make it impossible to ever be utilitarian. Future research should look at more individual differences and populations to determine if findings are the same.

Consider the following: a train is out of control and will kill five people, you can save them if you switch the train lines – however in doing so you will kill one person; you must choose if switching the tracks is the moral thing to do (Thomson, 1985; Tinghog et al., 2016). Making moral decisions is a part of everyday life; however, people are often distracted or emotionally tied to the scenario and according to some theories, this may impact their response. Understanding the underlying processes and factors that shape moral decisions will alert us of potential biases and issues, and allow us to make informed decisions.

Scenarios such as this cause dilemmas because they create conflict. This conflict is between two primary moral principles that influence moral decision making. The two principles are Utilitarianism and Deontology.

Utilitarian decision making requires one to weigh the costs and benefits of a situation and make a decision that results in the best outcome for the greatest number of people (Mill; as cited in Conway & Gawronski, 2013). In the opening example, more specifically, the response is deemed utilitarian if the line is switched and one is killed to save five. The utilitarian response has been considered a reflective, logical approach, that requires greater cognitive resources than a deontological response (Green et al., 2004; Tinghog et al., 2016). Utilitarian responses require extra cognitive resources because one needs to make a conscious decision after weighing up the costs and benefits of each possible action.

A Deontological response follows the concept that an act itself can be immoral, (Kant; as cited in Conway & Gawronski, 2013). An act can be considered immoral even if it produces a utilitarian outcome. In the above example, although switching the tracks would result in fewer deaths, the decision-maker actively engages in an action that leads to the death of a person who would have otherwise survived; thus, the response would

be deemed deontological if the tracks were not switched. This is considered an intuitive and emotional approach that requires fewer cognitive resources than utilitarian responses (Tinghog et al., 2016). Deontological responses require fewer cognitive resources because they are emotionally driven (Tinghog et al., 2016) and do not require deliberation of consequences. Some scenarios trigger a stronger emotional reaction, and therefore, a greater deontological response. These are often personal questions. Personal questions are those in which the question asks if the reader would personally harm or kill the target to save others. For instance, scenarios where the decision maker is asked to think about pushing someone in front of a train (Tinghog et al., 2016) or imitate cutting someone's throat with a plastic knife (Cushman, Gray, Gaffey, & Mendes, 2012) (as opposed to pulling a lever), are considered personal, and elicit a greater emotional response (Greene et al., 2001). Using personal questions to elicit more emotional responses and thus create more internal conflict, allows one to measure the underlying processes more easily.

The current research will investigate the effect of cognitive load on moral decisions. Cognitive load has become an integral part of moral decision-making research. Different theoretical frameworks suggest varying levels of cognitive resources are needed in the decision-making process. As a result, each theory predicts that cognitive load will have different effects on moral decisions. Cognitive load can be used in many forms, however the most commonly used are: divided attention, memory tasks, or time pressure. This is important not only from a theoretical perspective (we can extend research and provide further support for a particular theory), but also from a practical one because consequential moral decisions are made under cognitive load in many domains, including: political, military, and management settings.

## Single Process Theories

Some theories suggest moral decisions are driven by a single process (one process or area of the brain underpins the decision (Tinghog et al., 2016)). In earlier years of cognitive psychology, the predominant theory claimed that moral decision making relied solely on reasoning and higher order thinking (Kohlberg & Piaget; as cited in Haidt, 2001); this is referred to as rationalist (Haidt, 2001). This theory suggests moral decisions are driven by logic and reasoning (Tinghog et al., 2016) and therefore, should require more cognitive resources than an emotional/intuitive response.

Rationalist theory suggests that logical reasoning determines moral decisions, and that there is no emotional component. This should result in people making utilitarian decisions all the time, even when under cognitive load. This can be considered an unlikely outcome, resulting in researchers developing and testing alternate theories.

In more recent years, another single process theory has been studied and is well supported. The Social Intuitionist Model (Haidt, 2001) suggests that moral decision making is driven by automatic, effortless responses and is only followed by further processing to justify the immediate response (Haidt, 2001). This justification process can be tainted, however, by the confirmation bias (Nickerson, 1998). The confirmation bias suggests that people will stop a search for information when they find some that supports their ideas or arguments (Nickerson, 1998). This is exacerbated when the information is regarding one's moral beliefs (Lord, Ross, & Lepper, 1979). The Social Intuitionist Model justification phase suggests that one makes an intuitive decision based on internalised moral rules that were created by their society or culture. Haidt (2001) argues, however, that if a decision requires further reasoning it is most often achieved through social interaction, rather than internal reflection. Plebe (2015) suggested morality is learned through cultural practices and reinforced by emotions,

which too supports the model. This theory allows people to make either deontological or utilitarian decisions quickly and without using cognitive resources; therefore, differing responses to the same dilemma stem from personal differences. Personal differences are due to influences such as cultural practices and reinforcement history; these change the extent to which an individual's intuitive response is based on utilitarian principles or deontological principles. A key piece of evidence that lead Haidt to develop the Social Intuitionist Model is that people have difficulty justifying their moral decisions, especially those that elicit strong emotions (Haidt, Bjorklund & Murphy, 2000). Haidt et al. suggest this is due to the emotional process underlying moral decision making; as well as learned social and cultural rules.

### **Dual Process Theories**

The most prominent theory in moral psychology is the dual-process theory (Greene, Nystrom, Engell, Darley, & Cohen, 2004). The theory postulates that when making a difficult moral decision two processes are triggered. The first is an emotional response, which aligns with deontological principles. The secondary process is a cognitive judgement about the consequences of a decision, aligning with utilitarian principles. These are thought to occur in this order; however, the second (cognitive) competes with the first. The theory was supported through further fMRI studies that showed, when people made utilitarian decisions, areas in their brain that control reasoning were activated, as well as emotional areas (Greene et al., 2004). Koenigs et al. (2007) showed that when the ventromedial prefrontal cortex (VMPC) (used in emotion) is damaged, people make utilitarian responses to an abnormally large proportion of moral dilemmas. Furthermore, responses were compared to a group of people with general brain damage, which showed the VMPC, used in emotion, was influencing moral decision making rather than general damage (Koenigs et al., 2007). These

findings are in line with the dual process; if the VMPC is not intact, there is no emotional response, no competition between emotion and cognition and therefore the utilitarian response is most common. Additionally, Valdesolo and DeSteno (2006) hypothesised that if a moral dilemma caused minimal emotional anguish, the conflict between utilitarian and deontological responses would not be as great, and as such utilitarian responses would be more common. To test this, they induced positive emotions in participants by showing them a comedy skit for five minutes before asking them to answer moral dilemmas. Results confirmed their hypothesis; inducement of neutral emotion allowed the dilemma to cause natural levels of conflict, which lead to more deontological responses. In comparison, when the induced emotion was positive, there was less internal conflict and utilitarian decisions were more common (Valdesolo & DeSteno, 2006).

According to dual process theories, cognitive load should affect moral decision making, specifically utilitarian responding. This is because the secondary process, used to make a utilitarian judgement, requires more cognitive resources to calculate costs and benefits. When under increased cognitive load, fewer resources are available for the decision-making process, resulting in the logical argument not being strong enough to override an emotionally-driven response. As a result, utilitarian decisions will be less likely when cognitive load is high; deontological decisions, however, should not be affected. Multiple studies have manipulated cognitive load to determine if a dual or single process model dictates moral decision making, however, results have been mixed (Greene, Morelli, Lowenberg, Nystrom & Cohen, 2008; Conway & Gawronski, 2013; Trémolière & Bonnefon, 2014; Tinghog et al, 2016). Greene, et al. (2008) reported that increase in cognitive load reduced the number of utilitarian judgements, whilst having no effect on deontological ones. They concluded this through research that asked

participants in the cognitive load condition to answer difficult moral dilemmas whilst reading aloud and simultaneously hitting a computer key every time a specific number crossed the screen; the control group only answered the dilemmas. Tinghog et al. (2016) completed a similar study, testing the dual-process model using cognitive load, however, their results showed no selective effect of cognitive load and concluded the results supported the Social Intuitionist model. Thus, results on the effect of cognitive load in moral decision making are mixed.

Gürçay and Baron (2017) suggest that the above findings support an alternate version of the dual process model; a simultaneous one. Gürçay and Baron showed this by recording participant's computer mouse path after reading a moral dilemma (similar to the ones used in the current study) and examining whether the path changed from making a deontological decision to a utilitarian decision. Results indicated that there was no significant difference between changing from deontological to utilitarian and changing from a utilitarian to a deontological response; however, a large proportion did make a change both ways (which may have been why there was no significant difference). Whilst both changing of response patterns occurred, they were caused by the specific dilemma (Gürçay & Baron, 2017). Koop (2013), whose experiment Gürçay and Baron loosely replicated, found the same results. Gürçay and Baron also showed that approximately five times the number of participants that did switch, did not change responses. This could be interpreted as the change happens sequentially or that there was no change at all, supporting the Social Intuitionist Model (Haidt, 2001).

### **Recent Approaches to Understanding Moral Decision Making**

In recent years there have been several studies providing potential explanations for the discrepancies in regards to the effect of cognitive load on moral decisions. These

include varying the benefits of making a utilitarian decision and developing more sophisticated measures of deontology and utilitarianism.

### **Kill/Save Ratio**

A study, by Trémolière and Bonnefon (2014), discovered a moderating factor on the effect of cognitive load; which they called the Kill/Save Ratio (KSR). Trémolière and Bonnefon (2014) suggested that if the number of people killed is far less than the number of people saved (e.g. 1 vs. 500) then the ratio is efficient, and people should be able to make a utilitarian decision with little to no cognitive resources. Trémolière and Bonnefon further suggested that if the number of people killed did not greatly differ to the number of people saved (e.g. 1 vs. 5) then the decision requires more cognitive effort. Therefore, when the ratio is efficient cognitive load should have no impact on utilitarian decision making. When the ratio is inefficient, however, utilitarian decision making will be harder (as the costs and benefits will be closer) and cognitive load will have a more pronounced effect on utilitarian responses. Neither an efficient nor inefficient KSR should affect deontological responses. To test this, Trémolière and Bonnefon asked participants to answer moral dilemmas where the KSR was manipulated with the number of people that would be saved varied from five to 500. Cognitive load was also manipulated. Trémolière and Bonnefon found that increasing the efficiency (still sacrificing the one to save more people) of KSR increased utilitarian responding. They also found that KSR moderated the effect of cognitive load. Under cognitive load; when the KSR was inefficient, utilitarian responding was lower. However, under cognitive load, when KSR was efficient utilitarian responding was greater. When time restrictions were added to the deliberation process, this effect became even larger.



Gürçay and Baron's (2017) study: asking moral questions and watching mouse paths to determine if there was a sequential switch from deontological to utilitarian responding, also manipulated the KSR. Gürçay and Baron varied the KSR each question, so participants were presented with an array of efficiencies (kill one to save: 100, 25075, 50050, 75025, 100000). Their results showed that as the ratio became more efficient (saving more people for the same one death), participants' responses became more utilitarian; this led to a small effect. Trémolière and Bonnefon found a larger effect of KSR than Gürçay and Baron. This may be due to the fact they only tested two extreme KSRs, rather than presenting a varying range of ratios with a single presentation, as done by Gürçay and Baron (2017).

One limitation with Trémolière and Bonnefon's (2014) experiments was the way they measured utilitarian responding. They manipulated KSR within-subjects, and only analysed data points where a participant made a different response to the efficient than they did in the inefficient ratio version of a dilemma (and vice versa). This may have led to an overestimation of the effects of KSR on utilitarian responding (because cases where KSR did not affect decisions were omitted), and a potentially misleading result regarding the interaction between KSR and load.

### **Process Dissociation Measures of Utilitarian and Deontological Principles.**

Another big advance in the study of moral decision making was achieved by Conway and Gawronski (2013). They utilised Jacoby's (1991) Process Dissociation (PD) procedure and applied it to decision making (normally used in perception, memory, and thought etc.). This allowed them to measure the extent to which moral decisions were driven by utilitarianism or deontology; the procedure produces an inclination of both principles, for an individual. Conway and Gawronski note that traditional measures pit deontological and utilitarian decisions against each other, measuring responses as only

utilitarian or deontological, as if they were inversely related (i.e. if a participant responds mostly in a utilitarian manner, they may be classified utilitarian even though they answered some deontologically), which can distort results and lead to ambiguity. This means researchers cannot tell if manipulations are increasing one type of response or decreasing the other (Conway & Gawronski, 2013); and could be the reason studied effects of cognitive load are contradictory.

PD requires the decision maker to read two versions of a scenario; incongruent and congruent. Incongruent scenarios are those which are commonly used in moral decision-making research, such as the train problem described in the opening paragraph. These inherently create a conflict between utilitarian and deontological principles. One response would be acceptable by utilitarian standards (pulling the switch to change the train lines, saving five and killing one) whilst the other is not; but is acceptable by deontological standards (not touching the switch and letting five *die*, but not *killing* any). Congruent scenarios differ as they do not create conflict between the two principles; that is – one (yes/no) response is acceptable by both principles and the other is unacceptable by both principles. For example, “You are driving through a busy city street when all of a sudden a young mother carrying a child trips and falls into the path of your vehicle. You are going too fast to brake in time; your only hope is to swerve out of the way. Unfortunately, the only place you can swerve is currently occupied by a group of children on their way to elementary school. If you swerve to avoid the young mother and baby, you will kill all of them. Is it morally acceptable to swerve and hit the schoolchildren in order to avoid the young mother and child?” In this example, taking action would be unacceptable for both principles (see appendix C for all questions).

From these scenarios, Conway and Gawronski (2013) were able to deduce inclinations of utilitarianism and deontology, using the following equations (where:  $U$  is

a utilitarian inclination and  $D$  is a deontological inclination;  $c$  denotes congruent questions and  $i$  denotes incongruent questions;  $u$  denotes the number of utilitarian responses and  $d$  denotes the number of deontological questions, as shown in Figure 1.).

$$U = p(\text{unacceptable}|\text{congruent}) - p(\text{unacceptable}|\text{incongruent})$$

$$= (uc + [(1 - uc) * dc]) - ((1 - ui) * di)$$

$$D = p(\text{unacceptable}|\text{incongruent}) / (1 - U)$$

$$= ((1 - ui) * di) / (1 - U)$$

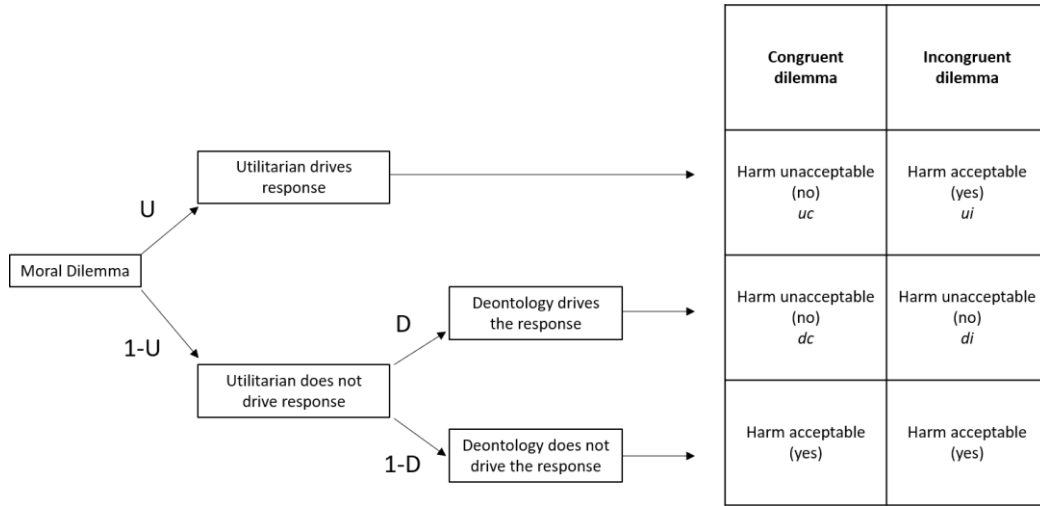


Figure 1. Flow chart of processing adapted from Conway and Gawronski (2013)

(2013). Yes and no, are responses to moral dilemmas, see appendix C (“is it morally acceptable to do kill/harm x to save y?”).

The first equation deduces the probability of a utilitarian response based on all responses (see Figure 1.), and the second deduces the probability of a deontological response from the remaining responses, not accounted for by utilitarian inclinations. There is a proportion not accounted for by either (1-D). The resulting inclinations allowed Conway and Gawronski to analyse the effect of cognitive load on both inclinations for each individual. Results showed cognitive load reduces utilitarian

inclinations whilst having no effect on deontological inclinations, providing strong support for the dual-process model.

### **Sex Differences and Moral Decision Making**

The effect of sex on moral decision making has been contested for many years. Tinghög et al., (2016) showed that males were more utilitarian in their responses to moral dilemmas, whilst women were more deontological. They suggest this may be due to different cognitive processes between men and women. Ward and King (2018) furthered this argument and suggested that women are more likely to make decisions based on emotion; thus, leading to greater deontological responses. They showed emotion was a key influence on moral decision making by asking women to answer moral dilemmas as unemotionally as possible and comparing this to a group of females and a group of males who had no instructions. Their study showed women who were answering unemotionally did not respond significantly differently to the group of males but did to the control group of females (Ward & King, 2018).

### **The Current Study**

Our current study has two main aims, and one secondary aim. The first is to use the PD approach to investigate how the effect of cognitive load on moral decisions varies with KSR. Trémolière and Bonnefon (2014) found that the effect of cognitive load on utilitarian responding was reduced when the KSR was efficient (i.e. sacrificing one to save a large number of others). However, Trémolière and Bonnefon used the traditional method of measuring utilitarian responses; using the PD approach will provide a more accurate test of their theory. *Hypothesis 1:* In line with the dual process model, we expect that KSR will moderate the effect of cognitive load on utilitarian inclinations. We expect that high cognitive load will reduce utilitarian decision making

and there will be a weaker to null effect of cognitive load when the KSR is efficient. It is also expected there will be no effect of cognitive load on deontological inclinations.

The second aim is to test whether KSR affects the extent to which moral decisions are driven by deontological inclinations. Several models predict deontological responding will be affected by various factors such as emotional and instinctual reactions (e.g. personal problems). However, no theories make predictions about the effect of KSR on deontological inclinations. *Hypothesis 2:* We did not make specific predictions about the effects of KSR on deontological responses, but treated this as exploratory research.

Our secondary aim was to provide further evidence for the effect of sex on utilitarian decision-making, using the PD approach. *Hypothesis 3:* We expect males to have greater utilitarian inclinations than females.

## **Method**

### **Design**

Only one study has investigated the effect of cognitive load on PD measures of utilitarian and deontological responses to moral dilemmas (Conway & Gawronski, 2013). This study included approximately 30 participants per cell of their between-subjects design. The results showed a moderate to large effect of cognitive load on utilitarian responding. In the context of these findings, we conducted a power analysis to estimate the sample size required to detect a moderate size effect (Cohen's  $f = .36$ ; converted from the partial eta squared value reported in Conway & Gawronski, 2013), with power of 0.8. This analysis yielded a suggested sample size of 135 participants, which we treated as a desired minimum sample size.

The experiment used a 2x2 between-subjects, factorial design. The independent variables were cognitive load (high and low) and kill/save ratio (efficient and

inefficient). The dependent variables were a measurement of deontological and utilitarian inclinations, derived from the congruent and incongruent problems, using the PD approach.

## **Participants**

Participants were recruited via posts on Facebook and SONA. Participants were randomly allocated into one of four groups. Eligibility requirements were that participants were at least 18 years of age. Three hundred participants were recruited. One hundred and thirty-four participants' data was removed. Not finishing the study lead to 125 being removed. Failing to respond appropriately (i.e. not make an attempt) to six, or more, digit string replications resulted in eight participants' data being removed. We counted the number of "blank" (or not appropriate) responses per participant and tested different cut offs. This did not make much difference to how many participants were omitted so we used six blanks (one third of responses) as our omission criteria. One person was removed as they admitted to giving up in the memory task replication section. The remaining 166 participants were aged 18-73 ( $M=33.5$ ,  $SD=12.9$ ); 125 females aged 18 to 73 ( $M=33.3$ ,  $SD=12.4$ ) and 40 males aged 19 to 68 ( $M=34.5$ ,  $SD=14.4$ ), and one 24-year-old who did not identify as female or male.

## **Materials**

### **Moral problems**

Participants answered 18 moral questions, presented in a random order (9 base questions with a congruent and incongruent version). Questions were adapted, from studies by Conway and Garwonski (2013) and Trémolière and Bonnefon (2014), so kill/save ratios and congruence could be implemented, respectively. The questions were selected based on their manipulability. All questions were changed to first person, to create questions where the decision-maker was asked to consider themselves in the

scenario as the person faced with the dilemma. All questions were framed in the first person. The literature shows a well evidenced difference in responding, such that problems framed in the first person rather than the third person (sometimes termed “personal” problems) elicit more conflict between utilitarian and deontological principles and tend to promote a stronger influence of deontological principles (e.g., Greene et al., 2001; Koenigs et al., 2007). However, we chose not to manipulate the personal framing of problems because our focus was on the effect of cognitive load and KSR on moral decisions.

Of the eight incongruent moral dilemma scenarios, two involved situations where the decision-maker (i.e., the participant) was also faced with death if he or she deemed the action unacceptable (i.e. responded in a deontological way and chose not to act). For example, the participant might be asked to imagine themselves as one of many passengers on an overcrowded lifeboat, and asked whether it is acceptable to throw one person out of a life boat to prevent it sinking (Tinghog et al. 2016). People are likely to make more utilitarian decisions in these types of scenarios (due to self-preservation) than ones where the decision-maker is not faced with death if he or she deems the action unacceptable. We did not have an a-priori reason to expect that the effects of cognitive load or KSR would vary systematically with this aspect of the dilemmas, and thus did not treat it as a manipulation.

The eight moral questions adapted from Conway and Garwonski’s study involved worded quantities (e.g. A few, many, hundreds), as opposed to Trémolière and Bonnefon’s ten questions, that utilised integers (e.g. 5, 500). We kept this format for three purposes: not to distort the wording of the Conway and Garwonski’s questions, mitigate any effects that may arise from using subjective (several, many) quantities, and to minimise the effect of using a memory task with numbers - Gürçay and Baron (2017)

note that if the cognitive load manipulation involves integers, it may reduce attention to that particular dimension (number of lives saved/lost) in the moral question.

Half of the questions asked participants if it was appropriate to kill someone in order to save others, whilst the remainder asked whether or not it was morally acceptable. As these ultimately ask the same thing, to keep all problems consistent, half were changed so all asked if it were morally acceptable. See Appendix C for the questions.

### **Cognitive load**

Previous studies, such as that by Greene et al. (2008), utilised a number search task as a way of dividing attention and, hence reducing the cognitive resources available for a moral dilemma task being completed at the same time. In such tasks participants are required to hit a button each time they see the number “5” appear in a string of numbers running across the bottom of the screen; they are told their accuracy will be recorded. For the current study we utilised a common memory task to manipulate cognitive load (variations of this task have often been used in prior research; e.g. Conway & Garwonski, 2013; DeShon, Brown, & Greenis, 1996; Tinghog et al, 2016). Before viewing each moral dilemma, participants viewed a new digit string. The high cognitive load group viewed a randomly generated 7-digit string, that included: numbers (0 to 9), lower case and capital letters (a to z and A to Z) and symbols (those on a QWERTY keyboard, e.g. R#6diL!), for 10 seconds. The low cognitive load condition viewed strings that had 3 digits and only including numbers and letters (e.g. 123); for 10 seconds. Although some previous studies (DeShon et al., 1996) have minimised the time allowed for memorising for the low cognitive load condition, we held this constant to reduce the possibility that a time limit might inadvertently add extra cognitive load in



the low cognitive load conditions, thereby weakening the experimental manipulation (e.g. Tinghog et al, 2016).

## **Manipulation Checks**

### **Cognitive load**

A space for replication of the digit string, to observe if the task was a cognitive priority (Trémolière & Bonnefon, 2014), was presented after the Likert scale, mentioned above. A self-report measure of whether remembering the digit string used a lot of energy (yes or no) (Tinghog et al., 2016) followed each replication of the digit string. If the cognitive load manipulation was effective the measure would be answered ‘yes’ more often in the high cognitive load group than the low cognitive load group.

### **Congruence and kill/save ratio**

A Likert scale measuring problem difficulty (Conway & Garwonski, 2013) was presented after a response to each question was made. The scale had 5 points rated from “very easy (1)” to “very hard (5)” (Conway & Garwonski, 2013). This was used to note if participants had noted the congruence of questions (we would expect congruent problems to be rated as easier than the incongruent questions) and KSR (we would expect those in the efficient KSR groups to rate the problems as easier than the inefficient KSR groups).

## **Procedure**

All participants were initially lead to a site, using LimeSurvey software (Version 2.06; Schmitz, 2015), that provided them with information about the study and required consent to move forward (see appendix A). Following this, they received instructions and a practice question with the exact format of the remainder of the study (see appendix D). A hyperlink directed them to the actual study, where they were randomly allocated into one of four groups: high cognitive load/inefficient KSR, low cognitive

load/ inefficient KSR, high cognitive load/ efficient KSR, low cognitive load/ efficient KSR.

Participants were asked not to use methods other than their memory to remember digit strings. They were then presented with either a hard (high cognitive load) or easy digit string (low cognitive load), depending on their allocated group; for 10 seconds. They were told they would be asked to recall the digit later. Participants could not move forward in the study until the 10 seconds had elapsed.

After the allocated time they were shown a moral question and asked to respond (by checking yes or no) to the moral acceptableness of the proposed action. cognitive load and KSR remained consistent for each participant and only varied between groups. After responding to the moral question, participants were asked: how difficult the question was to answer (1 = very easy, to 5 = very hard), then to recall the digit string, and finally, if remembering the digit string used a lot of energy (yes/no); in that order. This pattern was continued until all eighteen questions were answered. Participants were asked to provide demographic information (sex, age, English speaking). Participants were thanked for their time and invited to enter the draw to win one of six \$50 vouchers or receive 30 minutes of course credit (for psychology students). See appendix D for a further detail of the instructions, wording and layout.

### **Analysis**

We conducted a 2x2 Bayesian factorial analysis of variance (ANOVA), to measure the effect of cognitive load and kill/save ratio on utilitarian and deontological inclinations. A Bayesian ANOVA provides a Bayes factor (BF), which is a value that is used to compare theories (Rouder, Morey, Speckmanc & Province, 2012). The BF provides a way of collating evidence for the null hypothesis, something null hypothesis significance testing does (Rouder et al., 2012). A Bayesian ANOVA was used in the

current study to provide support for the null hypothesis (and our alternate theory), if null results were found; something other studies have failed to do.

## **Results**

According to criteria by Kass and Raftery (1995) a BF of 3.2 or greater is substantial evidence that the data support one hypothesis over the other (10 – 100 is strong and  $> 100$  is decisive). Jeffreys (1961) suggests similar:  $BF > 3$  is some evidence,  $> 10$  is strong evidence and  $> 30$  is classified as very strong evidence. A  $BF_{01}$  provides evidence in support of the null and a  $BF_{10}$  ( $1/ BF_{01}$ ) provides evidence for the alternate hypothesis.

### **Manipulation checks**

#### **Cognitive load**

Replication of the digit string was used as a removal criterion. Participants were removed if they admitted to giving up trying to remember the digit string or leaving more than 6 (one third) of the digit recall sections blank/entering random words or symbols (e.g. no idea, ????, \*, Jeremy).

The data show definitive evidence that the cognitive load manipulation was effective and had an impact on participants rating of whether or not remembering it used much energy,  $BF_{10} = 2.76e^{35}$ . The proportion of responses stating that remembering the digit string used a lot of energy was greater in the high cognitive load condition ( $M = 85.14$ ,  $SD = 14.32$ ) than in the low cognitive load condition ( $M = 29.34$ ,  $SD = 24.85$ ).

#### **Congruence and kill/save ratio**

The average proportion of “yes” responses to congruent moral questions (yes, it is acceptable to kill someone to save no-one) was lower (10.44%), than the average proportion of “yes” responses, to the incongruent problems (yes, it is acceptable to kill someone to save few or many) (48.26%),  $BF_{10} = 4.61e^{33}$ . The BF provides definitive

evidence that the data support the alternate hypothesis, and confirms people noted congruence.

There was definitive evidence of a difference between difficulty ratings for congruent and incongruent questions  $BF_{10} = 2.75e^{23}$ . Average difficulty scores for the congruent questions ( $M = 2.47$ ,  $SD = 0.76$ ) were lower than those for incongruent questions ( $M = 3.18$ ,  $SD = 0.88$ ). These means suggest people scored congruent problems as easy to answer and rated incongruent ones as hard to answer, showing people noted congruence.

There is sufficient evidence to suggest that KSR has no effect on ratings of problem difficulty,  $BF_{01} = 5.84$ . Difficulty ratings were almost the same in the inefficient group ( $M = 2.81$ ,  $SD = 0.79$ ) and the efficient group ( $M = 2.83$ ,  $SD = 0.70$ ).

Overall, our manipulation check analyses indicate that the manipulations of cognitive load and KSR were effective, and that participants found it subjectively more difficult to respond to congruent problems than congruent ones.

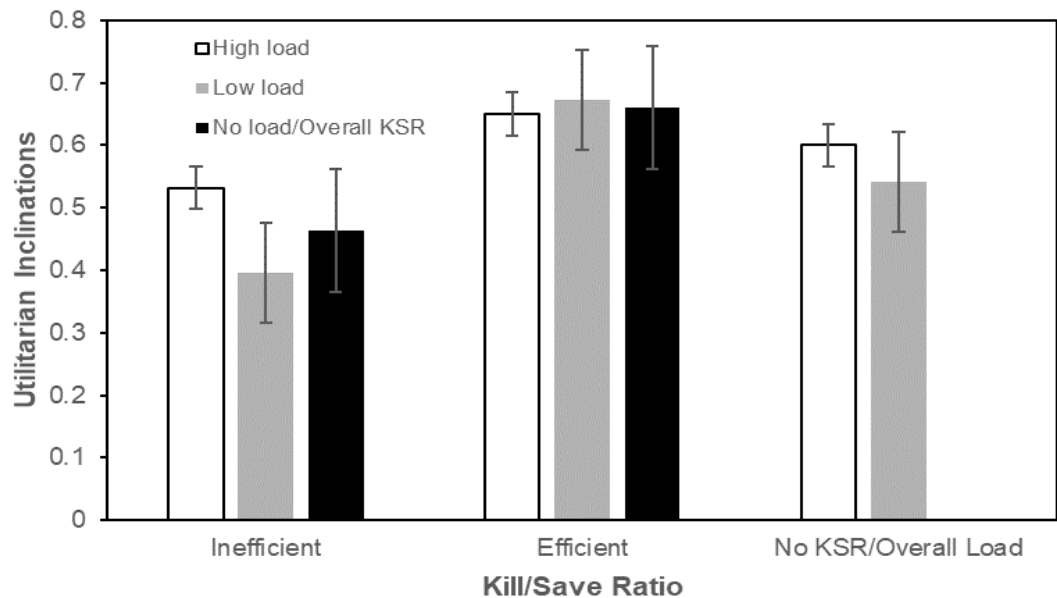
### **Utilitarian (U) and Deontological (D) Inclinations**

Data was analysed to see if it met the assumptions for an analysis of variance (ANOVA); normal distribution, no outliers, homogeneity of variance, and linearity of a residual plot. There was some skew in the distribution, however was not deemed severe enough to prevent running the analysis. Outliers were removed during the data cleaning phase; all other assumptions were met.

A 2 (cognitive load) x 2 (KSR) Bayesian ANOVA, with utilitarian inclinations as the dependent measure, yielded a best fitting model that included: a main effect of KSR, no main effect of cognitive load, and no interaction. This model is approximately four times stronger at fitting the data than the model that included the interaction. There was definitive evidence suggesting an effect of KSR on utilitarian responding,  $B_{10} =$

1203.25; where utilitarian responses were lower ( $M = 0.46$ ,  $SD = 0.31$ ) when KSR was inefficient, compared to efficient ( $M = 0.66$ ,  $SD = 0.28$ ).

There is no evidence suggesting that cognitive load affected utilitarian inclinations. Collapsed across levels of KSR the mean utilitarian inclination for high cognitive load was 0.60 ( $SD = 0.27$ ) and was 0.54 ( $SD = 0.34$ ) for the low cognitive load group. The BF suggests some evidence in favour of the null hypothesis, rather than ambiguous evidence (Jeffreys, 1961),  $B_{01} = 3.10$ . There was no interaction between cognitive load and KSR.

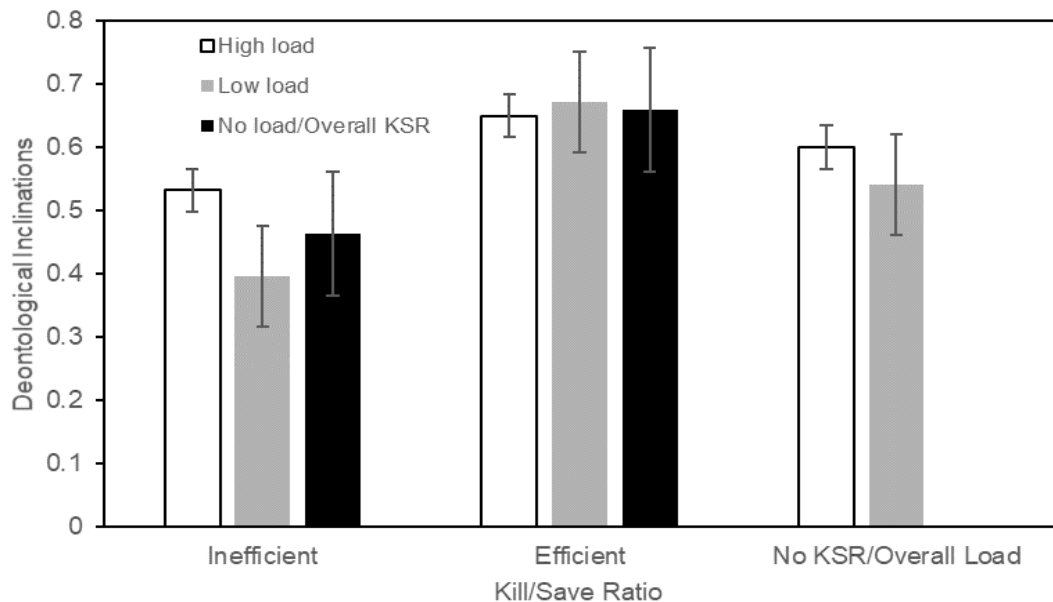


*Figure 2.* Effects of cognitive load and KSR on utilitarian inclinations. Error bars denote standard error.

A second 2 (cognitive load) x 2 (KSR) Bayesian ANOVA, with deontological inclinations as the dependent measure, yielded a best fitting model that included: a main effect of KSR, no main effect of cognitive load, and no interaction. This model is approximately four and a half times stronger at fitting the data than the model that included the interaction. There was sufficient evidence (Kass & Raffety, 1995) of an effect of KSR on deontological responding,  $B_{10} = 5.40$ ; where deontological responses

were higher ( $M = 0.80$ ,  $SD = 0.29$ ) when KSR was inefficient, compared to efficient ( $M = 0.66$ ,  $SD = 0.38$ ).

There is no evidence suggesting that cognitive load affected deontological inclinations. Collapsed across levels of KSR the mean deontological inclinations for high cognitive load was 0.73 ( $SD = 0.34$ ) and was 0.72 ( $SD = 0.36$ ) for the low cognitive load group. The BF suggests sufficient evidence in favour of the null hypothesis, rather than ambiguous evidence (Kass & Raffety, 1995),  $B_{01} = 5.89$ . There was no interaction between cognitive load and KSR



*Figure 3.* Effects of cognitive load and KSR on deontological inclinations. Error bars denote standard error.

There was an effect of sex on utilitarian inclinations. As there was only one person who identified as neither male nor female, we assumed the difference was between males and females. Results show males were more utilitarian in their responding ( $M = 0.68$ ,  $SD = 0.24$ ) than females ( $M = 0.53$ ,  $SD = 0.32$ ),  $BF_{10} = 4.37$ . The BF shows sufficient evidence of this difference (Kass & Raffety, 1995).

## **Discussion**

The main motivation for this study was to use the PD procedure to better assess the effects of cognitive load on utilitarian responding to moral dilemmas under different levels of KSR. The results did not support the first hypothesis that cognitive load would reduce utilitarian responding, and that this effect would be greater when KSR was inefficient. Our results showed that there was no effect of cognitive load overall, and this did not vary between efficient and inefficient KSR.

The manipulation check shows the memory task was successful at inducing cognitive load, as more people in the high cognitive load group rated remembering the digit string as requiring more effort, than in the low group. Therefore, an ineffective manipulation of cognitive load was not the reason for our null results.

Based on either primary theory (dual process or Social Intuitionist Model) our results support the hypothesis that cognitive load will have no effect on deontological inclinations. Although the best fitting model did not include an interaction, the pattern of means for utilitarian responding was also assessed to examine whether there was any evidence in support of the expected interaction. The pattern of results for the inefficient KSR conditions shows higher utilitarian responding in the high cognitive load group than in the low cognitive load group. This pattern is the opposite of what we would expect if the dual process model (Greene et al., 2004) was underpinning moral decisions; the dual-process model predicts that higher cognitive load will reduce utilitarian responding. However, these results can be explained by the Social Intuitionist Model (Haidt, 2001). According to the Social Intuitionist Model, the effects of cognitive load differ between individuals based on cultural and social influences, which can promote an intuitive tendency to respond either in a utilitarian or deontological way.

Thus, cognitive load can potentially decrease utilitarian responding, increase utilitarian responding, or have a null effect, depending on individual differences.

As we used Bayesian analyses, we have shown that there is increasing evidence in favour of the null hypothesis (rather than just not supporting the alternate), and thus, the Social Intuitionist Model, which is a new addition to the research.

We also found that KSR affected utilitarian decisions. This result was consistent with theory and previous findings (Trémolière & Bonnefon, 2014); when KSR was efficient, utilitarian decisions increased. Theory suggests this is due to an efficient KSR making utilitarian decisions easier to make. Our manipulation check for KSR, however, shows this may not be the underlying mechanism. Trémolière and Bonnefon (2014) suggest that KSR may not make the decision easier but make it harder to respond in a deontological way. Our manipulation check shows support for this theory: although KSR increased utilitarian responding, the decision was still rated as difficult. Although the manipulation check was conducted on all 18 questions, there remains no effect ( $BF_{01} = 5.39$ ) when just using incongruent problems in the analysis (inefficient KSR:  $M = 3.21$ ,  $SD = 0.90$ ; efficient KSR:  $M = 3.15$ ,  $SD = 0.86$ ) This shows the congruent problems were not decreasing the difficulty ratings when averaged.

Although our second hypothesis was exploratory, we were able to expand on current knowledge, by using the PD approach to explore the effect of KSR on deontological inclinations. We found that as the KSR became more inefficient, deontological responses increased. Recent research using manipulations, such as cognitive load, can affect utilitarian and deontological inclinations individually, and do not have to be viewed as causing a trade-off between the two types of principles (Conway & Gawronski, 2013). What the current results suggest, is that KSR is one



external factor that does lead to a trade-off of principles; increasing the KSR efficiency increases utilitarian responding and reduces deontological responding.

One possibility is that this effect could be caused by an inefficient KSR making the immoral act of killing someone more salient. This effect could be due to inefficient ratios making the scenario and hypothetical people more relevant and personable; thus, evoking more of an emotional state, leading to a deontological response (Sherman, Beike & Ryalls, 1999). When the ratio is efficient, however, the large number of people becomes a more abstract entity and the decision-maker loses the emotional connection; leading to logic driving the decision (i.e. a utilitarian response) (Sherman, et al., 1999). To test whether this is the case, future research could add a measure of emotional reactivity, with the expectation that those in inefficient ratio groups, will have higher ratings of emotion than those in the efficient ratio groups.

Our results also supported the third hypothesis, that males would respond in a more utilitarian fashion. They showed an effect of sex on inclinations, such that males were more utilitarian than females. This supports hypothesis and results found by Tinghög et al., (2016). The fact that women answered more emotionally (deontological) builds on the work of Ward and King (2018).

The Social Intuitionist model may also play a role in determining the effect of KSR. Trémolière and Bonnefon (2014) found that even when they increased the KSR to 1:5000, 40% of people still responded in a deontological way; that is, some people develop and hold very strong deontological principles that tend to drive moral decisions, even when the utilitarian consequences are very large. Baron, Gürçay, Moore, and Starcke (2012) suggest this is due to strong individual beliefs about deontology. This is in line with the Social Intuitionist model, that external factors do not greatly, or completely, impact some individual values, caused by society and culture. Our study

was able to provide a more accurate depiction of this by using the PD approach. The PD approach showed, similarly, that utilitarian inclinations did increase as the ratio became more efficient, however was still not 100% utilitarian. Trémolière, De Nays, & Bonnefon, 2012) discovered that utilitarian responses were lower for questions that lead to hypothetical death, compared with those that lead to harm. This could be another reason out utilitarian responses were not higher, especially in the efficient KSR groups.

One main limitation to our study was that the sample was collected using first year university students and a snowball strategy, via sharing on Facebook (beginning with the student researcher and honours cohort). It is likely the sample was well educated and Australian dominant, due to the sampling method; however, this is unknown. This may have distorted results as cultural differences may not have been large. Many of the sample may have also had exposure to philosophy and the types of moral dilemmas used; thus, the sample is not greatly generalisable.

Another issue with the sample was that it was predominantly female. Our results showed males were more utilitarian inclined, but due to the greater proportion of women the utilitarian inclinations may have been underestimated.

Another limitation, that most moral decision-making studies face, is that people's reasoning and judgement may work differently for hypothetical scenarios. Haidt (2001) suggests that people may not respond in a way they normally would as there is no motivation to be correct (i.e. not real lives on the line), nor is it necessary to justify why a response was made. Anonymity may have also contributed to these effects, as people may respond differently in real life; once there are restrictions of social pressures. To combat these, a stronger test could include using role play type scenarios, similar to those used by Cushman et al. (2012). What one might find is the effect of an efficient KSR on utilitarian responses may get smaller, as the emotional

response becomes more overwhelming (due to physically pretending to harm someone, compared with imagining it).

Haidt (2001) also notes that the commonly used scenarios are unusual and non-representative moral judgements. Although this is true, it is likely that most moral decisions are made the same way within an individual. Therefore, using scenarios such as the ones used in the current study can determine the underlying processes – which can then be extrapolated onto other moral decisions.

Although the current results provide some evidence toward the null hypothesis, it should be noted that as only low and high cognitive load were used, and there may have been an effect between these and no cognitive load. Future studies should determine whether this is the case by using three cognitive load conditions (control, low, high). The finding that a KSR of 1:500 does not induce complete utilitarian inclinations could be caused by the current study only measuring two KSRs (1:5 and 1:500). Future research should use the PD to determine when or if there is a KSR where utilitarian inclinations near 1; or if there will always be a discrepancy caused by individual differences. The three proposed cognitive load conditions should be tested alongside the four KSR ratios used in Trémolière and Bonnefon's (2014) third experiment; to determine if there is a cognitive load or ratio where an interaction between the two becomes apparent.

From an applied perspective, the finding that cognitive load does not selectively affect one decision making strategy is good news for the public, especially those making moral decisions in high stakes contexts. It means that no matter how much cognitive load people are under (divided attention, using memory, time pressure, etc.) when making moral decisions, they will respond the same way they would have if not under cognitive load. Consequences of this, however, are that an individual's social and

cultural upbringing will determine their responses. For people in high power positions, such as army generals or a judge, this is most important and may need to be screened for; or taken into consideration. It is also important for this context to be aware that people may become more utilitarian when enough people will die otherwise (efficient KSR) and this could have negative impacts. Conversely, people may become more conservative and deontologically inclined as the KSR becomes more inefficient. Future research should aim to look at the effects of cognitive load and KSR in the above populations, as well as: criminals, different cultures, and including people from more diverse backgrounds (e.g. ranges of socioeconomic status) to determine if these are universal effects.

However, as our results suggest individual differences play the greatest role in determining how people will respond, it might be beneficial to test the effect of cognitive load and KSR within one person. It may be possible that cognitive load has no effect due to the fact there is no universal, moral decision-making process. One may find an effect of cognitive load at an individual level (in line with the dual process model); such that those with utilitarian responding in the low cognitive load condition will make less utilitarian decisions in a high cognitive load condition, but those who respond deontologically in the low cognitive load condition would not see a change in responding.

Potential moderating factors that were acknowledged in the method section in the current study, but not specifically tested, include whether the decision maker is the one that is required to kill/harm another, and whether the decision maker is at risk in the scenario. Future research should measure the effect of these factors by creating alternate versions of the moral problems; half where the decision maker is the protagonist and half not, and half where the decision maker also dies and half where they do not,

(similarly to the KSR and congruent versions) and comparing responses of each condition (within subjects). Testing the first moderating factor should lead to more deontological responding when the decision maker is the protagonist, as it should elicit more of an emotional response. The second moderating factor, whether the participant would also die if they do not sacrifice another, should lead to greater utilitarian responses and there should be less of an effect of KSR, as most people are likely to save their hypothetical self, no matter how many people die. Thus, the effects found in the current study may differ in scenarios where the participants would (hypothetically) die if they made a deontological choice.

As most of the results support the idea that the biggest influences on moral decision making are personal differences and social and cultural upbringing, this can be used to design future studies. Gürçay and Baron (2017) note that psychopaths make utilitarian responses easier, due to the different wiring of their brains. To confirm if KSR manipulates levels of empathy (or something else emotional), a sample of psychopaths could be compared with control sample. If empathy was the determining factor of the effectiveness of KSR, it would be expected that psychopaths had increased utilitarian inclinations when the KSR is efficient, but there should be no effect of KSR on deontological inclinations (which should be consistently low).

Overall, our manipulations were effective tests of our hypotheses. Results suggest social and cultural influences determine one's moral principles, in line with the Social Intuitionist Model. Therefore, cognitive load will have no effect on one's decision when the KSR is efficient or inefficient. Collapsed across levels of cognitive load, we found an efficient KSR increases utilitarian inclinations and reduces deontological inclinations; suggesting a trade-off. Future research should look at more individual differences and populations, to determine if these findings are the same.

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## **Appendices**

### **Appendix A: Ethics approval letter**

Dear Dr Palmer

Ethics Ref No: H0017588

Project title: Moral decision-making study

The above Minimal Risk application has been approved by the Chair of the Tasmania Social Sciences Human Research Ethics Committee, on behalf of the full committee. Approval is for four years and conditional upon receipt of an annual Progress Report. Ethics approval for this project will lapse if a Progress Report is not submitted.

A copy of the approval letter is attached for your records.

The Ethics Committee wishes you all the best with the project.

Kind regards

Ailin Ding

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Administration Officer Ethics

## **Appendix B: Information Sheet and Consent**

### **1. Invitation**

You are invited to participate in a Moral Decision-making study. This study is being conducted as part of Emily Reid's Honours degree. Emily is a fourth-year student under the supervision of Psychology Senior Lecturers Dr. Matt Palmer and Dr. Jim Sauer.

### **2. What is the purpose of this study?**

The purpose of this study is to investigate factors that influence how people make moral decisions.

### **3. Why have I been invited to participate?**

You have been invited to participate in the study as you expressed an interest and you meet all eligibility requirements. Your participation is completely voluntary and there will be no negative consequences if you decide to withdraw. Your responses will be completely anonymous. Withdrawing will have no impact on your studies, results or your involvement with the university. You can withdraw at any point during this study.

### **4. What will I be asked to do?**

You will be asked to read some hypothetical scenarios and answer some questions about the scenarios. Some of the scenarios involve moral dilemmas. For example, you may be asked whether it is acceptable to sacrifice one person's life to save a group of other people. You will also be asked to provide some basic information about yourself (e.g., age, sex). The study will take around 30 minutes in total, completed in a single session.

### **5. Are there any possible benefits from participation in this study?**

Your participation in this study will not provide you with any direct benefits. However, this research will contribute to a greater understanding of how people make moral decisions.

### **6. Are there any possible risks from participation in this study?**

There are no specific risks anticipated with participation in this study. However, in the unlikely event that you experience an emotional or personal response as a result of participation in this study, you can leave the study at any time.

### **7. What if I change my mind during or after the study?**

You are not required to complete this study once you start. You can withdraw at any time with no explanation. If you leave the website or your data is not complete, it will be deleted. If you change your mind after completing the study, we will not be able to re-identify your data and will not be able to remove it (because it will be stored in anonymous form).

### **8. What will happen to the information when this study is over?**

Your data will be stored in a password protected folder on the UTAS Psychology network drive for at least five years after any publications (e.g., in academic journals) that involve the data. After this period, the data will be archived. Only the researchers associated with this project (including this study and other related studies) will have access to the raw data. All of your responses will be completely anonymous.

**9. How will the results of the study be published?**

Results from the study will be used in Emily's Honours thesis. Results from this study and other related studies will be submitted to an academic journal for publication.

**10. What if I have questions about this study?**

If you have any queries or concerns about the research, please do not hesitate to contact Matt Palmer: [matt.palmer@utas.edu.au](mailto:matt.palmer@utas.edu.au) or Jim Sauer [jim.sauer@utas.edu.au](mailto:jim.sauer@utas.edu.au)

“This study has been approved by the Tasmanian Social Sciences Human Research Ethics Committee. If you have concerns or complaints about the conduct of this study, please contact the Executive Officer of the HREC (Tasmania) Network on +61 3 6226 6254 or email [human.ethics@utas.edu.au](mailto:human.ethics@utas.edu.au). The Executive Officer is the person nominated to receive complaints from research participants. Please quote ethics reference number [H0017588].”

**If you click yes and continue you are giving your consent to participate in the study and for us to use your data.**

Yes/no

## Appendix C: Moral Questions

Efficient	
INCONGRUENT	CONGRUENT
<p><b>Time Machine 01</b></p> <p>You find a time machine and travel back to the year 1920. While checking into a hotel, you meet a young Austrian artist and veteran of the First World War. You realize this is Adolf Hitler before his rise to power in Nazi Germany. He is staying in the hotel room next to yours and the doors are not locked. It would be easy to simply smother him with a pillow in his sleep and disappear, stopping the Second World War and the Nazi party before they even start. However, he has not committed any crimes yet and it seems wrong to hurt an innocent person. Is it morally acceptable for you to kill an innocent young Hitler in order to prevent the Second World War?</p>	<p><b>Time Machine 02</b></p> <p>You find a time machine and travel back to the year 1920. While checking into a hotel, you meet a young man who later abducted multiple children and held them comfortably for a week until their families paid him some ransom money. He is staying in the hotel room next to yours and the doors are not locked. It would be easy to simply smother him with a pillow in his sleep and disappear, stopping the abduction and ransom demands before they even start. However, he has not committed any crimes yet and it seems wrong to hurt an innocent person. Is it morally acceptable for you to kill this man in order to prevent him from taking the children hostage?</p>
<p><b>Car accident 03</b></p> <p>You are driving through a busy city street when all of a sudden a large mother's group carrying their children walk into the path of your vehicle. You are going too fast to break in time; your only hope is to swerve out of the way. Unfortunately, the only place you can swerve is currently occupied by an old lady on their way to an elementary school excursion. If you swerve to avoid the young mother and baby, you will kill the old lady. Is it morally acceptable to swerve and hit the old lady in order to avoid the mothers and children?</p>	<p><b>Car accident 04</b></p> <p>You are driving through a busy city street when all of a sudden a young mother carrying a child trips and falls into the path of your vehicle. You are going too fast to break in time; your only hope is to swerve out of the way. Unfortunately, the only place you can swerve is currently occupied by a class of children on their way to an elementary school excursion. If you swerve to avoid the young mother and baby, you will kill all of them. Is it morally acceptable to swerve and hit the schoolchildren in order to avoid the young mother and child?</p>
<p><b>Torture 05</b></p> <p>You are a police officer, and have recently caught a criminal you have been hunting for some time. He is allegedly responsible for rigging a series of explosive devices: some that have already gone off and some that have yet to detonate. He places explosives outside city cafes and sets them to go off at a time when many people are drinking coffee on the patios. In this manner, he has injured many people and might injure many more. Now that the criminal is in custody, you want to know where the unexploded bombs are so you can defuse them. He refuses to talk, so you decide to use "aggressive interrogation techniques" like holding his head under water and beating him. Is it morally acceptable for you to use "aggressive interrogation techniques" in order to find and defuse the unexploded bombs?</p>	<p><b>Torture 06</b></p> <p>You are a police officer, and have recently caught a criminal you have been hunting for some time. He is allegedly responsible for rigging a series of paint bombs: some that have already gone off and some that have yet to detonate. He places paint bombs outside city cafes and sets them to go off at a time when many people are around. His explosives will spray nearby objects with paint. He has sprayed many cafes with paint and might spray many more. Now that the criminal is in custody, you want to know where the unexploded paint bombs are so you can defuse them and stop people being covered in paint. He refuses to talk, so you decide to use "aggressive interrogation techniques" like holding his head under water and beating him. Is it morally acceptable for you to use "aggressive interrogation techniques" in order to find and defuse the unexploded paint bombs?</p>
<p><b>Border Crossing 07</b></p>	<p><b>Border Crossing 08</b></p>

<p>You are a soldier guarding a border checkpoint between your nation and one troubled by insurgent violence. You notice a young man in a cheap car approaching the checkpoint with a determined look on his face. You suspect he means to bomb the checkpoint, killing all the soldiers inside. He is rapidly approaching your station. Is it morally acceptable for you to shoot and kill the approaching man?</p>	<p>You are a soldier guarding a border checkpoint between your nation and one troubled by insurgent violence. You notice a young man in a cheap car approaching the checkpoint with a determined look on his face. You suspect he means to cross the border in order to work illegally inside your country; earning a lot of money. He is rapidly approaching your station. Is it morally acceptable for you to shoot and kill the approaching man?</p>
<p><b>Captive Soldier 09</b></p> <p>You are a military officer who was captured by the enemy with your 500 soldiers. One of your soldiers managed to escape and is now hiding. An enemy leader is looking for this soldier, and announces that he will kill the 500 soldiers if he does not find the missing soldier within 2 hr. You know where the soldier is hiding, and if you reveal where the soldier is, they will be killed instead. The only way for you to save the 500 soldiers is to reveal where the soldier is. Is it morally acceptable for you to reveal where the soldier is to save the 500 captives? (Yes/No)</p>	<p><b>Captive Soldier 10</b></p> <p>You are a military officer who was captured by the enemy with your 500 soldiers. One of your soldiers managed to escape and is now hiding. An enemy leader is looking for this soldier, and announces that he will hold the 500 soldiers captive for 2 days if he does not find the missing soldier within 2 hr. You know where the soldier is hiding, and if you reveal where they are, they will be killed. The only way for you to save your soldiers from being held captive is to reveal where the missing soldier is. Is it morally acceptable for you to reveal where the man is to stop 500 being held captive for 2 days? (Yes/No)</p>
<p><b>Bomb11</b></p> <p>You work in a company that employs 500 people. One morning, a masked and armed man comes in the building and warns that he planted explosives in the building, and that the countdown has started. He turns to you and offers a deal: If you kill a random person on the street outside, the explosion will be cancelled. The only way for you to save 500 employees is to kill one at random. Is it morally acceptable for you to kill one at random to save 500 others? (Yes/No)</p>	<p><b>Bomb 12</b></p> <p>You work in a company that employs 500 people. One morning, a masked man comes in the building and warns that he planted paint bombs in the building, and that the countdown has started. He turns to you and offers a deal: If you kill a random person on the street, the paint bombs will be cancelled. The only way for you to save 500 employees from being covered in paint is to kill one at random. Is it morally acceptable for you to kill one at random to save 500 others? (Yes/No)</p>
<p><b>Antibodies13</b></p> <p>You are an army doctor. After a massive attack from the enemy, 500 soldiers have been urgently transported in the military medical facility. They all need rare antibodies. Another soldier is also within the facility, who was put in an artificial coma a few days earlier. His life is not in danger. This soldier could be harvested for the antibodies that would save all the others. The only way for you to save the 500 soldiers is to harvest the antibodies of the other soldier, who will die in the process. Is it morally acceptable for you to harvest this soldier for antibodies and kill him in the process, to save the 500 other soldiers? (Yes/No)</p>	<p><b>Antibodies14</b></p> <p>You are an army doctor. After a massive attack from the enemy, 500 soldiers have been urgently transported in the military medical facility. They all need rare antibodies. Another soldier is also within the facility, who was put in an artificial coma a few days earlier. His life is not in danger. This soldier could be harvested for the antibodies that would save all the others. Or you can order the antibodies from a lab; this will only take 30mins longer. Is it morally acceptable for you to harvest this soldier for antibodies and kill him in the process, to save the 500 other soldiers 30mins faster? (Yes/No)</p>
<p><b>Virus 15</b></p>	<p><b>Virus 16</b></p>

<p>You are in charge of a big pharmaceutical company. A terrible virus has spread in a part of the building where 500 people work. These people are now confined, and they will die if they do not get the proper antidote. Two chemical compounds were recently designed in the lab, one of which is the antidote, but you cannot tell which is which. There are two other men with you; both under your responsibility. The only way for you to save the 500 employees is to inject each compound into one of the men with you, killing one in the process. Is it morally acceptable for you to kill one of these men to save the 500 other employees? (Yes/No)</p>	<p>You are in charge of a big pharmaceutical company. The flu virus has spread in a part of the building where 500 people work. These people are now confined, and they will get sick if they do not get the proper antidote. Two chemical compounds were recently designed in the lab, one of which is the antidote, but you cannot tell which is which. There are two other men with you; both under your responsibility. The only way for you to save the 500 employees from getting the flu is to inject each compound to one of the men with you, killing one in the process. Is it morally acceptable for you to kill one of these men to stop the 500 other employees getting sick? (Yes/No)</p>
<p><b>Hacker17</b> You are an army general. You are based in a building in which 500 other people work. One day, the alarm unexpectedly warns people that a missile is about to be launched. A hacker announces by radio that he can direct this missile at any time on the building where You and the 500 other people are working. The hacker announces that if you accept to direct the missile yourself on the medical wing of the building, then you and the other 500 people will be saved. However, one person is working in the medical wing, and will be killed. The only way for you to save the 500 people is to direct the missile on the medical wing and kill the person who is working there. Is it morally acceptable for you to direct the missile on the medical wing and kill the person who is working there, to save 500 others? (Yes/No)</p>	<p><b>Hacker18</b> You are an army general. You are based in a building in which 500 other people work. One day, the alarm unexpectedly warns people that a missile is about to be launched. A hacker announces by radio that he can direct this missile at any time on a paddock nearby where you and the 500 other people are working. The hacker announces that if you accept to direct the missile yourself on the medical wing of the building, then the crops in the paddock will be saved. However, one person is working in the medical wing, and will be killed. The only way for you to save the crops is to direct the missile on the medical wing and kill the person who is working there. Is it morally acceptable for you to direct the missile on the medical wing and kill the person who is working there, to save the crops? (Yes/No)</p>

<b>Inefficient</b>	
<b>INCONGRUENT</b>	<b>CONGRUENT</b>
<p><b>Time Machine 01</b> You find a time machine and travel back to the year 1920. While checking into a hotel, you meet a woman. You realize this is a young Lawrence Scott Dame, a man who would go on to kill his sister's family. He is staying in the hotel room next to yours and the doors are not locked. It would be easy to simply smother him with a pillow in his sleep and disappear, stopping the murder of an innocent family. However, he has not committed any crimes yet and it seems wrong to hurt an innocent person. Is it morally acceptable for you to kill an innocent young</p>	<p><b>Time Machine 02</b> You find a time machine and travel back to the year 1920. While checking into a hotel, you meet a young petty criminal. You realize this is George Brackman, a man who later on abducted a child and held her comfortably for a week until her family paid him some ransom money. He is staying in the hotel room next to yours and the doors are not locked. It would be easy to simply smother him with a pillow in his sleep and disappear, stopping the abduction and ransom demands before they even start. However, he has not committed any crimes yet and it seems wrong to hurt an innocent person. Is it morally</p>

Lawrence in order to prevent the murder of an innocent family?	acceptable for you to kill George Brackman in order to prevent him from taking a child hostage?
<b>Car accident 03</b> You are driving through a busy city street when all of a sudden a young mother carrying a child trips and falls into the path of your vehicle. You are going too fast to break in time; your only hope is to swerve out of the way. Unfortunately, the only place you can swerve is currently occupied by a little old lady. If you swerve to avoid the young mother and baby, you will kill the old lady. Is it morally acceptable to swerve and hit the old lady in order to avoid the young mother and child?	<b>Car accident 04</b> You are driving through a busy city street when all of a sudden a young mother carrying a child trips and falls into the path of your vehicle. You are going too fast to break in time; your only hope is to swerve out of the way. Unfortunately, the only place you can swerve is currently occupied by a group of children on their way to elementary school. If you swerve to avoid the young mother and baby, you will kill all of them. Is it morally acceptable to swerve and hit the schoolchildren in order to avoid the young mother and child?
<b>Torture 05</b> You are a police officer, and have recently caught a criminal you have been hunting for some time. He is allegedly responsible for rigging a series of explosive devices: some that have already gone off and some that have yet to detonate. He places explosives outside city cafes and sets them to go off late in the evening when very few people will be on the patios. He has not injured many people and may not injure any more. Now that the criminal is in custody, you want to know where the unexploded bombs are so you can defuse them. He refuses to talk, so you decide to use “aggressive interrogation techniques” like holding his head under water and beating him. Is it morally acceptable for you to use “aggressive interrogation techniques” in order to find and defuse the unexploded bombs	<b>Torture 06</b> You are a police officer, and have recently caught a criminal you have been hunting for some time. He is allegedly responsible for rigging a series of explosive devices: some that have already gone off and some that have yet to detonate. He places explosives outside city cafes and sets them to go off at a time when very few people are around. His explosives will spray nearby objects with paint. He has sprayed few cafes with paint and may not spray any more. Now that the criminal is in custody, you want to know where the unexploded paint bombs are so you can defuse them. He refuses to talk, so you decide to use “aggressive interrogation techniques” like holding his head under water and beating him. Is it morally acceptable for you to use “aggressive interrogation techniques” in order to find and defuse the unexploded paint bombs?
<b>Border Crossing 07</b> You are a soldier guarding a border checkpoint between your nation and one troubled by insurgent violence. You notice a young man in a cheap car approaching the checkpoint with a determined look on his face. You suspect he means to bomb the checkpoint, killing a couple of guards outside. He is rapidly approaching your station. Is it morally acceptable for you to shoot and kill the approaching man?	<b>Border Crossing 08</b> You are a soldier guarding a border checkpoint between your nation and one troubled by insurgent violence. You notice a young man in a cheap car approaching the checkpoint with a determined look on his face. You suspect he means to cross the border in order to live illegally inside your country. He is rapidly approaching your station. Is it morally acceptable for you to shoot and kill the approaching man?
<b>Captive Soldier 09</b> You are a military officer who was captured by the enemy with your 5 soldiers. One of your soldiers managed to escape and is now hiding. An enemy leader is looking for this soldier, and announces that he will kill the 5 soldiers if he does not find the missing soldier within 2 hr. You know where the soldier is hiding, and if you reveal where the soldier is, they will be killed	<b>Captive Soldier 10</b> You are a military officer who was captured by the enemy with your 5 soldiers. One of your soldiers managed to escape and is now hiding. An enemy leader is looking for this soldier, and announces that he will hold the 5 soldiers captive for 2 days if he does not find the missing soldier within 2 hr. You know where the soldier is hiding, and if you reveal where they are, they will



<p>instead. The only way for you to save the 5 soldiers is to reveal where the soldier is. Is it morally acceptable for you to reveal where the soldier is to save the 5 captives? (Yes/No)</p>	<p>be killed. The only way for you to save your soldiers from being held captive is to reveal where the missing soldier is. Is it morally acceptable for you to reveal where the man is to stop 5 being held captive for 2 days? (Yes/No)</p>
<p><b>Bomb 11</b>  You work in a company that employs 5 people. One morning, a masked and armed man comes in the building and warns that he planted explosives in the building, and that the countdown has started. He turns to you and offers a deal: If you kill a random person on the street outside, the explosion will be cancelled. The only way for you to save 5 employees is to kill one at random. Is it morally acceptable for you to kill one at random to save 5 others? (Yes/No)</p>	<p><b>Bomb 12</b>  You work in a company that employs 5 people. One morning, a masked man comes in the building and warns that he planted paint bombs in the building, and that the countdown has started. He turns to you and offers a deal: If you kill a random person on the street, the paint bombs will be cancelled. The only way for you to save 5 employees from being covered in paint is to kill one at random. Is it morally acceptable for you to kill one at random to save 5 others? (Yes/No)</p>
<p><b>Antibodies 13</b>  You are an army doctor. After a massive attack from the enemy, 5 soldiers have been urgently transported in the military medical facility. They all need rare antibodies. Another soldier is also within the facility, who was put in an artificial coma a few days earlier. His life is not in danger. This soldier could be harvested for the antibodies that would save all the others. The only way for you to save the 5 soldiers is to harvest the antibodies of the other soldier, who will die in the process. Is it morally acceptable for you to harvest this soldier for antibodies and kill him in the process, to save the 5 other soldiers? (Yes/No)</p>	<p><b>Antibodies 14</b>  You are an army doctor. After a massive attack from the enemy, 5 soldiers have been urgently transported in the military medical facility. They all need rare antibodies. Another soldier is also within the facility, who was put in an artificial coma a few days earlier. His life is not in danger. This soldier could be harvested for the antibodies that would save all the others. Or you can order the antibodies from a lab; this will only take 30mins longer. Is it morally acceptable for you to harvest this soldier for antibodies and kill him in the process, to save the 5 other soldiers 30mins faster? (Yes/No)</p>
<p><b>Virus 15</b>  You are in charge of a big pharmaceutical company. A terrible virus has spread in a part of the building where 5 people work. These people are now confined, and they will die if they do not get the proper antidote. Two chemical compounds were recently designed in the lab, one of which is the antidote, but you cannot tell which is which. There are two other men with you; both under your responsibility. The only way for you to save the 5 employees is to inject each compound into one of the men with you, killing one in the process. Is it morally acceptable for you to kill one of these men to save the 5 other employees? (Yes/No)</p>	<p><b>Virus16</b>  You are in charge of a big pharmaceutical company. The flu virus has spread in a part of the building where 5 people work. These people are now confined, and they will get sick if they do not get the proper antidote. Two chemical compounds were recently designed in the lab, one of which is the antidote, but you cannot tell which is which. There are two other men with you; both under your responsibility. The only way for you to save the 5 employees from getting the flu is to inject each compound to one of the men with you, killing one in the process. Is it morally acceptable for you to kill one of these men to stop the 5 other employees getting sick? (Yes/No)</p>
<p><b>Hacker 17</b>  You are an army general. You are based in a building in which 5 other people work. One day, the alarm unexpectedly warns people that a missile is about to be launched. A hacker</p>	<p><b>Hacker 18</b>  You are an army general. You are based in a building in which 5 other people work. One day, the alarm unexpectedly warns people that a missile is about to be launched. A hacker</p>

<p>announces by radio that he can direct this missile at any time on the building where you and the 5 other people are working. The hacker announces that if you accept to direct the missile yourself on the medical wing of the building, then you and the other 5 persons will be saved. However, one person is working in the medical wing, and will be killed. The only way for you to save the 5 people is to direct the missile on the medical wing and kill the person who is working there. Is it morally acceptable for you to direct the missile on the medical wing and kill the person who is working there, to save 5 others? (Yes/No)</p>	<p>announces by radio that he can direct this missile at any time on a paddock nearby where you and the 5 other people are working. The hacker announces that if you accept to direct the missile yourself on the medical wing of the building, then the crops in the paddock will be saved. However, one person is working in the medical wing, and will be killed. The only way for you to save the crops is to direct the missile on the medical wing and kill the person who is working there. Is it morally acceptable for you to direct the missile on the medical wing and kill the person who is working there, to save the crops? (Yes/No)</p>
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## Appendix D: Screenshot Example of Study (LimeSurvey)

Take note of the following digit string, you will be asked to replicate it later.

**RVt\_\*HJ**

Time remaining  
03 seconds

You are in charge of a big pharmaceutical company. A terrible virus has spread in a part of the building where 5 people work. These people are now confined, and they will die if they do not get the proper antidote. Two chemical compounds were recently designed in the lab, one of which is the antidote, but you cannot tell which is which. There are two other men with you; both under your responsibility. The only way for you to save the 5 employees is to inject each compound into one of the men with you, killing one in the process. Is it morally acceptable for you to kill one of these men to save the 5 other employees?

☐ Yes  
☐ No

How difficult did you find the question you just answered?

	Very easy	Easy	Neither easy nor hard	Hard	Very hard
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please report the digit string presented before the question in the space below.

Did remembering this digit string require a lot of energy?

☐ Yes  
☐ No